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10/722,048

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Mark Andrew Whittaker Stewart

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EXAMINER

LOO, JUVENA W

ART UNIT

PAPER NUMBER

2616

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/722,048

Applicant(s)

STEWART, MARK ANDREW  
WHITTAKER

Examiner

Juvena W. Loo

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on September 25, 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-15, 17 and 19-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-15, 17 and 19-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Notice of Informal Patent Application
- ☐ Other: \_\_\_\_\_

### **DETAILED ACTION**

This action is in response to amendment filed on September 25, 2007 in which claims 1, 4, 5, 7, 9, 10, 14, 17, and 19 – 20 were amended. Claims 6, 16, and 18 were cancelled. Claims 2, 3, 8, 11 - 13, 15 remain unchanged. Claims 21 – 23 were added.

#### ***Status of Claims***

Claims 1 – 5, 7 – 15, 17, and 19 – 23 are pending, of which claims 1, 10, and 17 are in independent form.

Claims 1 - 5, 7 - 9, 11, 17, 19 – 21, and 23 are rejected under 35 USC 103(a).

Claims 10, 12 - 15, and 22 are rejected under 35 U.S.C. 102(a).

1. Applicant's arguments filed September 25, 2007 have been fully considered but they are not persuasive.

#### ***Claim Rejections - 35 USC § 112***

2. Claims 21 - 23 contain the trademark/trade name InfiniBand. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify

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a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe InfiniBand switch and, accordingly, the identification/description is indefinite.

***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 10, 12 - 15, and 22 are rejected under 35 U.S.C. 102(a) as being anticipated by Brahmaroutu (US 2003/0033427 A1).

Regarding claim 10, Brahmaroutu discloses a method, comprising:

providing a plurality of switches (Brahmaroutu: Figure 1: a switch fabric) coupling a plurality end nodes to form a network (Brahmaroutu: Figure 2; Page 2, Section 22: a data network with a switch fabric for allowing a host system to communicate to other systems);

calculating a plurality of routing trees for the plurality of switches (Brahmaroutu: Pages 5-6, Sections 46-54: the shortest paths from each switch to every other switch in the network are computed);

calculating a plurality of Destination Location Identifiers (DLID) and a set of forwarding instructions for each of the plurality of switches (Brahmaroutu: Page 7, Section 60: a destination local identifier is assigned to a switch port (destination port). The multi-path assignment algorithm first determines the destination switch that the destination port is directly connected to, then it identifies all the links that exist between the destination switch and other switches in the network), wherein each of the plurality of DLIDs corresponds to one of the plurality of routing trees and one of the plurality of end nodes (Page 7, Sections 61-63: once all paths are identified, the multi-path algorithm assigns a combination label to a specific path. All direct links that connect the destination switch to other switches are first sorted and then the multi-path algorithm looks up the best route between the switch identified and the switch from the all-switch shortest paths table); and

populating a forwarding table of each of the plurality of switches in the network with the plurality of DLIDs and the set of forwarding instructions (Brahmaroutu: Page 7, Section 66: once the forwarding tables are built for all switches, the forwarding tables will be downloaded into respective switches in the network) and

wherein the forwarding instructions create paths appropriate to make the network operate as a strictly non-interfering network (Brahmaroutu: Page 2, Section 22: separate channels for separate control flow and data flow may be used. For example, a channel may be created for sending request and reply messages while a separate channel or sets of channels may be used for moving data between the host system and any one of the remote systems).

Regarding claim 12, Brahmaroutu discloses all the limitations of claim 10. Additionally, Brahmaroutu discloses each of the plurality of end nodes comprises a destination, and wherein the destination is identified by a BaseLID (Brahmaroutu: Page 4, Section 31: every switch and each port may have one or more Local Identifiers (LIDs)).

Regarding claim 13, Brahmaroutu discloses all the limitations of claim 10. Additionally, Brahmaroutu discloses

calculating the plurality of routing trees comprises for each spine in the network (Brahmaroutu: Page 5-6, Section 46-54: the shortest paths between every switch pair are determined by using any All Pair Shortest Paths (APSP) algorithm),

calculating a shortest path for the spine node to each of the plurality of end nodes (Brahmaroutu: Page 7, Sections 60: the multi-path algorithm first determines the destination switch that the destination port is directly connected to, then it identifies all the links that exist between the destination switch and other switches in the network).

Regarding claim 14, Brahmaroutu discloses all the limitations of claim 10 above. Additionally, Brahmaroutu discloses each of the plurality of routing trees comprises at least a portion of a plurality of switches and corresponding plurality of links that form a shortest path from one of the plurality of end nodes to a spine node of the network (Brahmaroutu: Page 7, Section 60: the multi-path assignment algorithm looks up the best route between the switches from the all-switch shortest paths table).

Regarding claim 15, Brahmaroutu discloses all the limitations of claim 14 above. Additionally, Brahmaroutu discloses the shortest path is loop-less (Brahmaroutu: Page 6, Section 55: The results from the multi-path assignment algorithm give loop-less path).

Regarding claim 22, Brahmaroutu discloses all the limitations of claim 10 above. Additionally, Brahmaroutu discloses the switch is an InfiniBand switch in compliance with an InfiniBand Architecture Specification (Brahmaroutu: Page 2, Section 0021).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1 - 5, 7 - 9, 11, 17, 19 – 21, and 23 are rejected under 35 USC 103(a) as being unpatentable over Brahmaroutu (US 2003/0033427 A1) in view of Steele (US 2003/0118013 A1).

Regarding claim 1, Brahmaroutu discloses a method, comprising:

providing a plurality of switches (Brahmaroutu: Figure 1: a switch fabric), wherein the plurality of switches are coupled to form a network (Brahmaroutu: Figure 2; Page 2, Section 22: a data network with a switch fabric for allowing a host system to communicate to other systems);

providing a plurality of sources coupled to the network (Brahmaroutu: Figure 2; Page 2, Section 22: the network allows different host or remote system to send message);

providing a plurality of destinations coupled to the network (Brahmaroutu: Figure 2; Page 2, Section 22: the network allows different host or remote system to receive message);

calculating a plurality of routing trees for the plurality of switches (Brahmaroutu: Pages 5-6, Sections 46-54: the shortest paths from each switch to every other switch in the network are computed);

calculating a plurality of Destination Location Identifiers (DLID) and a set of forwarding instructions for each of the plurality of switches (Brahmaroutu: Page 7, Section 60: a destination local identifier is assigned to a switch port (destination port). The multi-path assignment algorithm first determines the destination switch that the destination port is directly connected to, then it identifies all the links that exist between the destination switch and other switches in the network), wherein each of the plurality of DLIDs corresponds to one of the plurality of routing trees and one of the plurality of destinations (Brahmaroutu: Page 7, Sections 61-63: once all paths are identified, the multi-path algorithm assigns a combination label to a specific path. All direct links that



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connect the destination switch to other switches are first sorted, then the multi-path algorithm looks up the best route between the switch identified and the switch from the all-switch shortest paths table); and

populating a forwarding table of each of the plurality of switches in the network with the plurality of DLIDs and the set of forwarding instructions (Brahmaroutu: Page 7, Section 66: once the forwarding tables are built for all switches, the forwarding tables will be downloaded into respective switches in the network) and

wherein the forwarding instructions create paths appropriate to make the network operate as a strictly non-interfering network (Brahmaroutu: Page 2, Section 22: separate channels for separate control flow and data flow may be used. For example, a channel may be created for sending request and reply messages while a separate channel or sets of channels may be used for moving data between the host system and any one of the remote systems). However, Brahmaroutu fails to teach that the switch fabric is a Clos network.

In the same field of endeavor, Steele discloses a Clos switch fabric that provides groups of source and destinations ports as well as routing information (Steele: Figure 1). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply a Clos network as disclosed by Steele into the network of Brahmaroutu. The motivation would have been in reducing latency and minimizing single point failures.

Regarding claim 2, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses each of the plurality of

destinations is identified by a BaseLID (Brahmaroutu: Page 4, Section 31: each port may have one or more Local Identifiers (LIDs)).

Regarding claim 3, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses calculating the plurality of routing trees comprises for each spine node in the network, calculating a shortest path from the spine node to each of the plurality of sources and each of the plurality of destinations (Brahmaroutu: Pages 5-6, Sections 46-54: the shortest paths between every switch pair are determined by using any All Pair Shortest Paths (APSP) algorithm).

Regarding claim 4, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses each of the plurality of routing trees comprises at least a portion of the plurality of switches and corresponding plurality of links that form a shortest path from one of the plurality of sources or one of the plurality of destinations to a spine node of the network (Brahmaroutu: Page 7, Sections 61-63: a destination local identifier is assigned to a switch port (destination port). The multi-path assignment algorithm first determines the destination switch to which the destination port is directly connected, it then identifies all the links that exist between the destination switch and other switches in the network. Once all paths are identified, the multi-path algorithm assigns a combination label to a specific path. All direct links that connect the destination switch to other switches are first sorted, then the

multi-path algorithm looks up the best route between the switch identified and the switch from the all-switch shortest paths table).

Regarding claim 5, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses

creating a packet at one of the plurality of sources, wherein the packet is addressed to one of the plurality of destinations (Brahmaroutu: Figure 3; Page 3, Section 27: a header is embedded in the data packet transmitted from a source node to a destination node);

executing a rearrangement algorithm for the network (Brahmaroutu: Page 6, Section 55: the multi-path assignment algorithm may also be executed when a topology change, such as an existing link goes down or a new link is inserted, occurs);

assigning one of the plurality of DLIDs to the packet (Brahmaroutu: Page 3, Section 28: a packet's header may contain local routing information such as a destination local identifier used to identify the destination port and data path in the data network, and a source local identifier used to identify the source port); and

the packet following a path through at least a portion of the plurality of switches from the one of the plurality of sources to the one of the plurality of destinations, wherein each of the portion of the plurality of switches forward the packet according to the one of the plurality of DLIDs assigned to the packet (Brahmaroutu: Figure 3; Page 3, Section 28: the header in a packet contains a destination local identifier and source local identifier to identify the destination and source ports for routing by the switches).

Regarding claim 7, the combination of Brahmaroutu and Steele discloses all the limitations of claim 5 above. Additionally, Brahmaroutu discloses the packet following the path comprises looking up the one of the plurality of DLIDs assigned to the packet in the forwarding table at each of the portion of the plurality of switches along the path from the one of the plurality of sources to one of the plurality of destinations (Brahmaroutu: Page 3, Section 28: a packet's header may contain local routing information such as a destination local identifier used to identify the destination port and data path in the data network, and a source local identifier used to identify the source port. They are used for routing by switches within the network).

Regarding claim 8, the combination of Brahmaroutu and Steele discloses all the limitations of claim 5 above. Additionally, Brahmaroutu discloses the calculation of the plurality of routing trees sufficient to execute the rearrangement algorithm (Brahmaroutu: Pages 5-6, Sections 46-54, Page 6, Section 58, and Page 6, Section 55: the shortest paths between every switch pair are determined by using any All Pair Shortest Paths (APSP) algorithm. The multi-path algorithm calculates the routing trees for the switch forwarding tables based on the switch connectivity information. The multi-path algorithm may also be executed when a topology change occurs).

Regarding claim 9, the combination of Brahmaroutu and Steele discloses all the limitations of claim 5 above. Additionally, Brahmaroutu discloses the packet following the path comprises each of the portion of the plurality of switches forwarding the packet

in accordance with the one of the plurality of DLIDs assigned to the packet as found in the forwarding table at each the portion of the plurality of switches (Brahmaroutu: Figure 3; Page 3, Section 28: the header in a packet contains a destination local identifier used to identify the destination port and data path and source local identifier to identify the destination and source ports for routing by the switches).

Regarding claim 11, Brahmaroutu discloses all the limitations of claim 10 above. However, Brahmaroutu fails to teach that the network is a Clos network. In the same field of endeavor, Steele discloses a Clos switch fabric that provides groups of source and destinations ports as well as routing information (Steele: Figure 1). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to apply a Clos network as disclosed by Steele into the network of Brahmaroutu. The motivation would have been in reducing latency and minimizing single point failures.

Regarding claim 17, Brahmaroutu discloses a method, comprising:

a plurality of switches (Brahmaroutu: Figure 1: a switch fabric) coupling a plurality sources and a plurality of destinations to form a network (Brahmaroutu: Figure 2; Page 2, Section 22: a data network with an InfiniBand switch fabric for allowing a host system to communicate to other systems);

creating a packet at one of the plurality of sources and is addressed to one of the plurality of destinations (Brahmaroutu: Figure 3; Page 3, Section 27: a header is embedded in the data packet transmitted from a source node to a destination node);

executing a rearrangement algorithm for the network (Brahmaroutu: Page 6, Section 55: the multi-path assignment algorithm may also be executed when a topology change, such as an existing link goes down or a new link is inserted, occurs);

assigning one of the plurality of DLIDs to the packet (Brahmaroutu: Page 3, Section 28: a packet's header may contain local routing information such as a destination local identifier used to identify the destination port and data path in the data network, and a source local identifier used to identify the source port); and

the packet following a path through the switch from one the plurality of sources to the one of a plurality of destinations, wherein each of the portion of the plurality of switches forwards the packet according to the plurality of DLIDs assigned to the packet (Brahmaroutu: Figure 3; Page 3, Section 28: the header in a packet contains a destination local identifier and source local identifier to identify the destination and source ports for routing by the switches) and

wherein the path is part of the network operating as a strictly non-interfering network (Brahmaroutu: Page 2, Section 22: separate channels for separate control flow and data flow may be used. For example, a channel may be created for sending request and reply messages while a separate channel or sets of channels may be used for moving data between the host system and any one of the remote systems). However, Brahmaroutu fails to teach that the switch fabric is a Clos network.

In the same field of endeavor, Steele discloses a Clos switch fabric that provides groups of source and destinations ports as well as routing information (Steele: Figure 1). Thus, it would have been obvious to one of ordinary skill in the art at the time of the

invention to apply a Clos network as disclosed by Steele into the teaching of Brahmaroutu. The motivation would have been in reducing latency and minimizing single point failures.

Regarding claim 19, the combination of Brahmaroutu and Steele discloses all the limitations of claim 17 above. Additionally, Brahmaroutu discloses the packet following the path comprises looking up the one of the plurality of DLIDs assigned to the packet in a forwarding table at each of the portion of the plurality of switches along the path from the one of the plurality of source to the one of the plurality of destinations (Brahmaroutu: Figure 3; Page 3, Section 28: the header in a packet contains a destination local identifier used to identify the destination port and data path and source local identifier to identify the source ports for routing by the switches).

Regarding claim 20, the combination of Brahmaroutu and Steele discloses all the limitations of claim 17 above. Additionally, Brahmaroutu discloses the packet following the path comprises each of the portion of the plurality of switches forwarding the packet in accordance with the one of the plurality of DLIDs assigned to the packet as found in a forwarding table at each the portion of the plurality of switches (Brahmaroutu: Page 2 Section 19: the switch may contain routing information, using explicit routing and/or destination address routing, to route data from a source node to a target node via corresponding links).

Regarding claim 21, the combination of Brahmaroutu and Steele discloses all the limitations of claim 1 above. Additionally, Brahmaroutu discloses the switch is an InfiniBand switch in compliance with an InfiniBand Architecture Specification (Brahmaroutu: Page 2, Section 0021).

Regarding claim 23, the combination of Brahmaroutu and Steele discloses all the limitations of claim 17 above. Additionally, Brahmaroutu discloses the switch is an InfiniBand switch in compliance with an InfiniBand Architecture Specification (Brahmaroutu: Page 2, Section 0021).

### ***Response to Argument***

Applicant submits, as in page 7, that “Brahmaroutu does not disclose that the forwarding table create paths appropriate to make the network operate as a strictly non-interfering network”. In addition, applicant states, as in page 8, that “Brahmaroutu does not disclose that the network is a strictly non-interfering network or that the forwarding instructions create paths for a strictly non-interfering network”. Applicant further states “Brahmaroutu does not disclose how the forwarding instructions would create the required strictly non-interfering network”. In reply, Brahmaroutu discloses the use of multi-path assignment algorithm to determine and identify all the links that exist between a destination switch and other switches in the network (Page 7, Section 60). Brahmaroutu also discloses that separate channels may be used for different functions.



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In other words, a channel may be used for transporting send request and reply messages while a separate channel or set of channels may be created for moving data between two nodes through switches so various sources do not attempt to use the same network resources at the same time (Page 2, Section 22). In other words, multiple channels can be dedicated to transport traffic between two nodes.

Applicant submits, as in page 8, that Brahmaroutu does not disclose that the forwarding table includes paths for a strictly non-interfering network as required by independent claim 10. In reply, Brahmaroutu discloses the use of multi-path assignment algorithm to identify all the links exist between a destination switch and other switches in the network (Page 7, Section 60). Brahmaroutu further discloses multiple channels can be created to transport traffic between two nodes in the network (Page 2, Section 22).

Dependent claims 12 - 15 remain to be rejected. The Examiner respectfully submits that claims 12 – 15 are unpatentable over Brahmaroutu for the same reason explained above.

Applicant submits, as in page 9, that the combination of Brahmaroutu and Steele does not disclose, teach or otherwise suggest that the forwarding table includes paths for a strictly non-interfering network or that the network operates a strictly non-interfering network as required by independent claims 1 and 17. In reply, Brahmaroutu discloses the use of multi-path assignment algorithm to determine and identify all the

links that exist between a destination switch and other switches in the network (Page 7, Section 60). Brahmaroutu also discloses that separate channels may be used for different functions. In other words, a channel may be used for transporting send request and reply messages while a separate channel or set of channels may be created for moving data between two nodes through switches so various sources do not attempt to use the same network resources at the same time (Page 2, Section 22). In other words, multiple channels can be dedicated to transport traffic between two nodes.

Dependent claims 2 – 5, 7 - 9, 11, and 19 - 20 remain to be rejected. The Examiner respectfully submits that claims 2 – 4, 6 – 10, and 12 – 15 are unpatentable over Brahmaroutu in view of Steele for the same reason explained above.

### ***Conclusion***

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juvena W. Loo whose telephone number is (571) 270-1974. The examiner can normally be reached on Mon.-Thurs: 7:00am-4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kwang Yao can be reached on (571) 272-3182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Juvena W Loo  
Examiner  
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**KWANG BIN YAO**  
**SUPERVISORY PATENT EXAMINER**

A handwritten signature in black ink, appearing to read 'Kwang Bin Yao', written over a horizontal line.